

ANNUAL REPORT FOR 2002



Gurley Mitigation Site
Greene County
Project No. 8.T340306
TIP No. R-1023WM



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SUMMARY

The following report summarizes the monitoring and construction activities during 2002 at the Gurley Mitigation Site in Greene County. Originally constructed in 1997, the site provides compensatory wetland mitigation for several NCDOT projects in the Neuse River Basin. In June 2001, the site was delineated again in order to verify that the site covered existing permit requirements. The Army Corps of Engineers approved the delineation in June 2001. The confirmed wetland delineation map that was produced from this exercise was included in the 2001 annual report.

The site is monitored with 16 groundwater monitoring gauges, three surface water gauges, and one rain gauge. The exact hydrologic success criterion varies for each gauge, depending upon its location within the site. Per the request of the Corps of Engineers, the hydrologic monitoring requirements of the site were changed from the requirements stated in the approved mitigation plan. The riverine portion of the site must show saturation for 12.5% of the growing season, while the non-riverine areas must show saturation within 12 inches of the surface for at least 8% of the growing season. Vegetation planting occurred in four zones, with multiple plots in each. The success criteria for vegetation is that a minimum survival rate of 320 trees per acre is required after three years; this minimum requirement is reduced by 10% for two years following the third year monitoring.

Hydrologic monitoring in 2002 showed two of four Riverine gauges recorded saturation for more than 12.5% of the growing season. Six of twelve non-Riverine gauges recorded saturation for more than 8% of the growing season. In total, eight of the sixteen gauges recorded saturation for less than 5% of the growing season. All three surface gauges show continuous saturation for the entire growing season. Vegetation monitoring yielded an average tree density of 530 trees per acre, which is well above the minimum success a criterion of 320 trees per acre.

NCDOT recommends that both hydrologic and vegetation monitoring continue.

1.0 INTRODUCTION

1.1 Project Description

The Gurley Tract Mitigation Site is located in Greene County, approximately 12 miles northeast of Goldsboro (Figure 1). The site provides 170 acres of both riverine and non-riverine restoration and enhancement. Gurley Tract provides compensatory mitigation for several projects in the Neuse River basin. The following plant communities are included in the site: Coastal Plain bottomland hardwood swamp, non-riverine wet hardwood forest, streambed Atlantic White Cedar Forest, and Cypress/Tupelo Swamp.

1.2 Purpose

In order to demonstrate successful mitigation, the site must achieve success for five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report describes the results of the hydrologic and vegetation monitoring during the 2002 growing season at the Gurley Tract Mitigation Site. Included in this report are analyses of both hydrologic and vegetative monitoring results as well as local climate conditions throughout the growing season. Updated site photographs are also provided.

1.3 Project History

The site was initially monitored for both wetland hydrology and vegetation in 1998. Since then, additional work has been completed on the mitigation site. Though 2002 represents the fifth year of both hydrologic and vegetation monitoring, it is the fourth year of monitoring following additional planting and remediation work in 1999.

December 1997	Site Constructed
January 1998	Site Planted
Spring 1998	Monitoring Gauges Installed
May - November 1998	Hydrologic Monitoring (1 yr.)
October 1998	Vegetation Monitoring (1 yr.)
February 1999	Zone 4 (Atlantic White Cedar Area) Planted
March - November 1999	Hydrologic Monitoring (2 yr.)
August 1999	Remediation on Nahunta Swamp bank
September & October 1999	Vegetation Monitoring (2 yr.)
March - November 2000	Hydrologic Monitoring (3 yr.)
October 2000	Vegetation Monitoring (3 yr.)
March - November 2001	Hydrologic Monitoring (4 yr.)
June 2001	Wetland Delineation of Site
June 2001	Vegetation Monitoring (4 yr.)
August-September 2001	GPS Mapping of Beaver Impoundment
March – November 2002	Hydrologic Monitoring (5 yr.)
September 2002	Vegetation Monitoring (5 yr.)

Figure 1. Site Location Map



1.4 Debit Ledger

Table 1. Gurley Tract Mitigation Site Debit Ledger

Site Habitat	Mitigation Plan			Ratios	TIP Debit								
	Acres at Start	Acres Remaining	Percent Remaining		R-525 D	R-1023 AB B	B-3070	R-2001 B	R-2719 BA	R-525 G	U-3472	R-1030	R-2719 BA
SPH Restoration (RR)	48.6	26.52	54.57	1.5:1	1.48	12.66	1.19	4.68			2.07		
BLH Restoration (NRR)	56.2	16.19	28.81	2:01	1.08	34.58				3.76	0.59		
BLH Enhancement	45.8	0	0.00	4:01		45.8							
SPH Preservation	5.9	0	0.00	10:01			5.9						
Total	170.2	42.71	25.09										

SPH: Swamp Hardwood

BLH: Bottomland Hardwood

RR: Riverine

NRR: Non-riverine

2.0 HYDROLOGY

2.1 Success Criteria

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12 inches of the surface) by surface or ground water for at least a consecutive 12.5% of the growing season. Areas inundated less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% and 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of hydrophytic vegetation and hydric soils.

Upon request of the US Army Corps of Engineers, the hydrologic monitoring requirements for the Gurley Tract site have been altered from the original mitigation plan. The new success criteria states that the riverine portions of the site must be saturated within 12 inches of the surface for at least 12.5% of the growing season. The non-riverine areas must be saturated for at least 8% of the growing season. Monitoring will be conducted for a total of five years. The riverine and non-riverine portions of the site are illustrated in Figure 2; riverine areas on this map are shaded.

According to the Soil Conservation Service, the growing season in Greene County extends from March 17 to November 15, approximately 244 days. A consecutive 12.5% of the growing season for Gurley Tract would equal 30.5 days; a consecutive 8% would be equivalent to 19.5 days. Local climate must represent average conditions for the area in order for the hydrologic data to be valid.

2.2 Hydrologic Description

Sixteen groundwater, three surface water, and one rain gauge are used on the Gurley Tract to monitor site hydrology (Figure 2). The automatic monitoring gauges record the depth to the groundwater level. Daily groundwater and rainfall measurements were taken throughout the growing season; the surface water gauges record water levels every three hours.

Appendix A contains a plot of the water depth for each of the monitoring gauges and surface gauge for 2002. Precipitation events, measured by the onsite rain gauge, are included on each graph as bars.

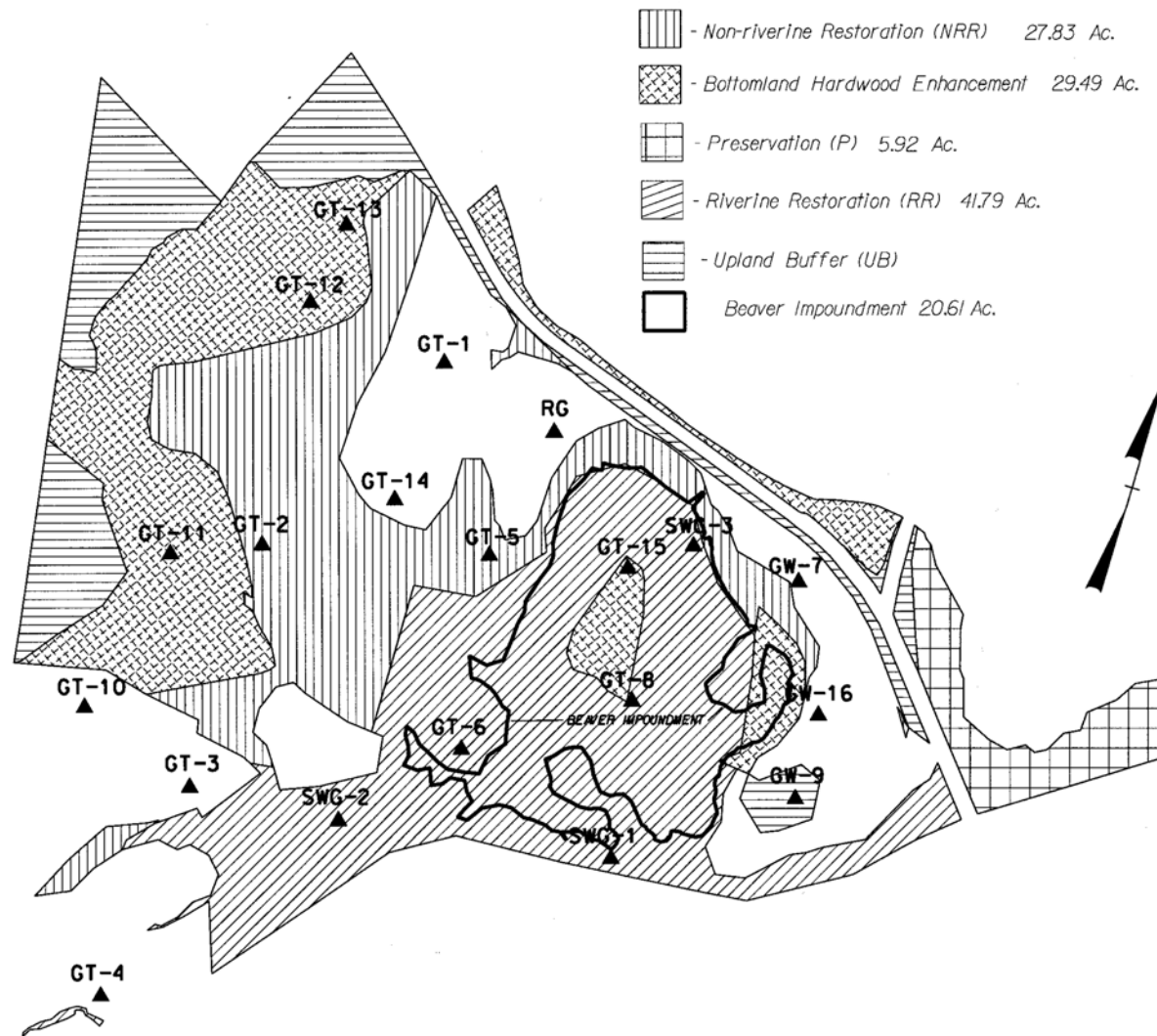


Figure 2. Monitoring Gauge Locations

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The total number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 244-day growing season. Table 2 presents the hydrologic results for 2002. Figure 3 is a graphical representation of the hydrologic monitoring results for 2002.

Gauge plots that show a “flatline” indicate either a maximum or minimum range for recording data. This does not necessarily mean there is a problem with the gauge, for example, when a graph reaches the 2 inch line, the water table is at least 2 inches above the ground and has “overtopped” the gauge.

Specific Monitoring Gauge Problems: Gauge 3 malfunctioned from Feb. to Apr. 22, gauge 1 malfunctioned from Apr. 23 to Jun. 11, gauge 11 malfunctioned from Jul. 24 to Aug. 28, and gauge 13 malfunctioned from Feb. 28 to Apr. 22. All the previous gauges were replaced. Gauges 15 and 8 could not be downloaded the entire growing season due to high water associated with the beaver pond.

Table 2. 2002 Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5-8%	8-12.5%	>12.5%	Actual %	Dates of Saturation
NON-RIVERINE (Success = saturation for 8% of the growing season)						
GW-1				✓	14.8	Mar 17 – Apr 21
GW-2		✓			4.9	Apr 10 – Apr 21
GW-3	✓				0	-
GW-5				✓	15.2	Mar 17 – Apr 22
GW-7	✓				1.2	Apr 1 – Apr 3
GW-9	✓				0.0	-
GW-10	✓				3.3	Apr 10 – Apr 17
GW-11				✓	28.7	Mar 17 – May 25
GW-12				✓	31.9	Mar 17 – Jul 2
GW-13				✓	22.1	Apr 23 – Jun 15
GW-15				✓	100.0	Mar 17 – Nov 15 (standing water)
GW-16	✓				0.8	Apr 1 – Apr 2
RIVERINE (Success = saturation for 12.5% of the growing season)						
GW-4	✓				0.0	-
GW-6				✓	33.2	Mar 17 – Jun 5
GW-8				✓	100.0	Mar 17 – Nov 11 (standing water)
GW-14			✓		10.6	Mar 14 - Apr 22

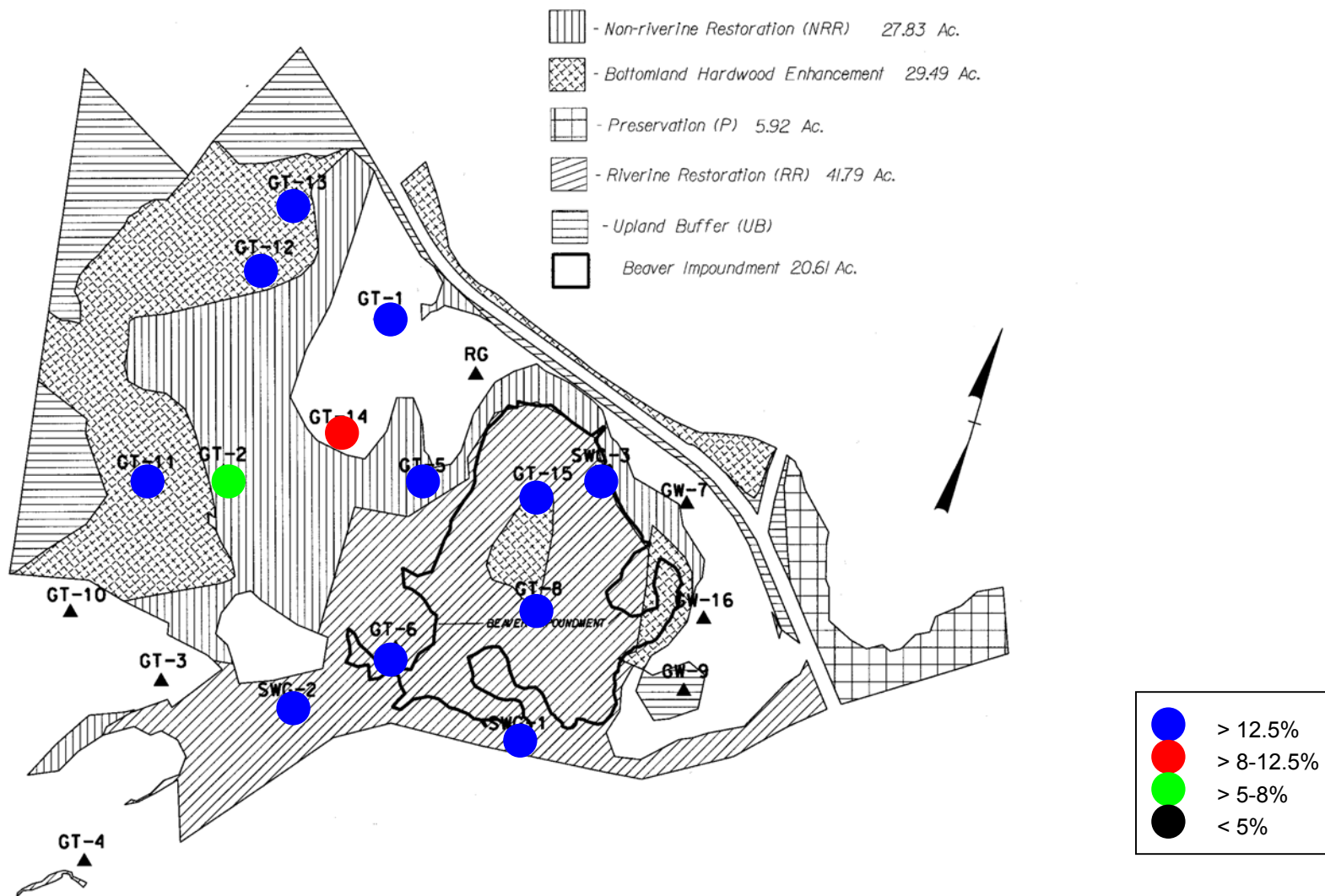


Figure 3. 2002 Hydrologic Monitoring Results

Hydrologic monitoring in 2002 showed two of the four riverine gauges recorded saturation for more than 12.5% of the growing season. Six of the twelve non-riverine gauges recorded saturation for more than 8% of the growing season. In total, eight of the sixteen gauges recorded saturation for less than 5% of the growing season. All three surface gauges show continuous saturation for the entire growing season.

2.3.2 Climatic Data

Figure 4 is a comparison of 2001-2002 monthly rainfall to historical precipitation for the area. The two lines represent the 30th and 70th percentiles of monthly precipitation for Goldsboro, NC. The bars are the monthly rainfall totals for 2001 and 2002. The historical data was provided by the NC State Climate Office; the onsite rain gauges provided the recent rainfall data.

Since November 2001, only in January was an above normal rainfall total recorded. The months of March- May 2002 were the only average months, while the remainder of the year the Goldsboro gauge recorded below average rainfall amounts. At the time of publication, data from November- December 2002 was not available. It will be included in the 2003 annual report. Overall, the site experienced below normal rainfall in 2002.

2.4 Conclusions

Hydrologic monitoring in 2002 showed two of the four riverine gauges recorded saturation for more than 12.5% of the growing season. Six of the twelve non-riverine gauges recorded saturation for more than 8% of the growing season. In total six of the sixteen gauges recorded saturation for less than 5% of the growing season. All three surface gauges show continuous saturation for the entire growing season. One possible explanation for decreased success at certain gauges is attributed to below average rainfall throughout portions of the growing season.

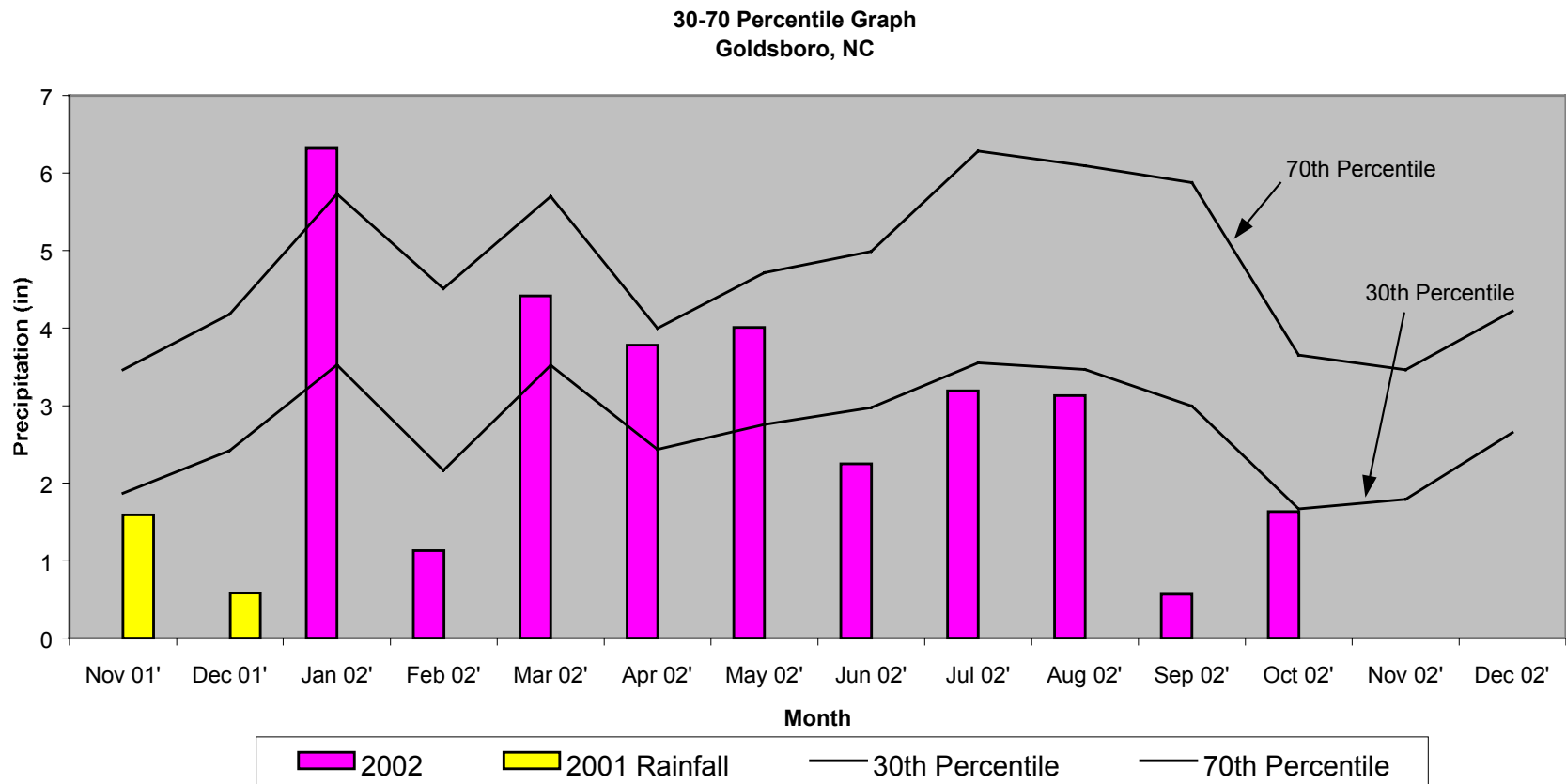


Figure 4. 30-70 Percentile Graph, Goldsboro, NC

3.0 VEGETATION

3.1 Success Criteria

The March 1998 Mitigation Plan states that there must be a minimum of 320 trees per acre living for at least three consecutive years. Subsequent permit conditions associated with the site state that NCDOT will monitor the site for five years. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5).

3.2 Description of Species

The following tree species were planted in the Wetland Restoration Area:

Zone 1: Coastal Plain Bottomland Hardwood Forest (18.86 acres)

Taxodium distichum, Baldcypress
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Nyssa aquatica, Water Tupelo
Quercus lyrata, Overcup Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Carpinus caroliniana, American Hornbeam

Zone 2: Non-Riverine Wet Hardwood Forest (17.57 acres)

Taxodium distichum, Baldcypress
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Quercus alba, White Oak
Pinus serotina, Pond Pine
Platanus occidentalis, American Sycamore
Nyssa aquatica, Water Tupelo
Quercus lyrata, Overcup Oak
Liriodendron tulipifera, Tulip Poplar
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Carpinus caroliniana, American Hornbeam

Zone 3: Streambank Levee Forest (3 acres)

Quercus michauxii, Swamp Chestnut Oak
Quercus alba, White Oak
Pinus serotina, Pond Pine
Platanus occidentalis, American Sycamore
Quercus lyrata, Overcup Oak
Salix nigra, Black Willow
Betula nigra, River Birch

Zone 4: Atlantic White Cedar Forest (7 Acres; Planted February 1999)

Chamaecyparis thyoides, Atlantic White Cedar
Nyssa aquatica, Water Tupelo
Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Nyssa sylvatica var. *biflora*, Swamp Blackgum

3.3 Results of Vegetation Monitoring

ZONE	Plot #	Baldcypress	Green Ash	Swp. Black Gum	Swp. Chestnut Oak	Water Oak	Willow Oak	Cherrybark Oak	Water Tupelo	Sycamore	Tulip Poplar	Pond Pine	White Oak	Atl. White Cedar	River Birch	Am. Hornbeam	Overcup Oak	Total (5 year)	Total (at planting)	Density (Trees/Acre)
1	2	11	2	12	8	4	6	10	10	1	3			1		3	1	72	63	777
	3	9			6	2	7	10	5	1							2	42	45	635
	T1	2	10		10	2	3		3		1				1			32	31	702
	T3	14			3			1										18	25	490
	T4		2					1										3	30	68
	T5	5	4			1	1		3						2			16	37	294
	ZONE 1 AVERAGE DENSITY																			494
2	4	3	5		7	3	8	5			5	5	3	3			1	48	55	593
	5	1	3		6		6	3	5	7	4	2	1					38	52	497
	6	15	2	7	5		1	11			7	3				1	1	53	50	721
ZONE 2 AVERAGE DENSITY																				604
4	1		9						3					2				14	33	288
	T2	1		1	8		4	5	9					25				53	47	767
ZONE 4 AVERAGE DENSITY																				528
TOTAL AVERAGE DENSITY																				530

Table 3. Vegetation Monitoring Statistics, by zone and plot

Site Notes:

Zone 1: Other species noted: trumpet creeper, *Aster* sp., fennel, winged sumac, broomsedge, woolgrass, cane, blackberry, muscadine, plume grass, *Juncus* sp., *Carex* sp., *Baccharis* sp., river birch, red maple, and sweetgum. The occurrence of these species does not appear to be affecting the survival of the planted trees. 18-24 inches of standing water in plot T4, 8-16 inches of standing water in T5. Beaver activity evident in plot T4.

Zone 2: Other species noted: trumpet creeper, *Baccharis* sp., fennel, red maple, *Aster* sp., honeysuckle, holly, broomsedge, sicklepod, sweetgum, and pine. The occurrence of these species does not appear to be affecting the survival of the planted trees.

Zone 3: Trees surviving along levee.

Zone 4: Other species noted: black willow, *Juncus* sp., smartweed, jewelweed, alder, cattails, and volunteer oaks. The occurrence of these species does not appear to be affecting the survival of the planted trees. The occurrence of these species does not appear to be affecting the survival of the planted trees.

3.4 Conclusions

Of the 426 acres of this site, approximately 46 acres involved tree planting. There were 6 test plots and 5 transects established throughout the planting areas. The 2002 vegetation monitoring of the planted areas revealed an average density of 494 trees per acre for Zone 1, 604 trees per acre for Zone 2 and 528 trees per acre for Zone 4. All zones are well above the minimum requirement of 260 trees per acre.

Though the site vegetation has been monitored for five years, it has only been four years since additional planting in 1999. NCDOT plans to monitor the site for a fifth growing season in 2003.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

Monitoring activities in 2002 at the Gurley Tract Mitigation Site included examination of both hydrologic and vegetation data. Hydrologic monitoring showed that only half of the sixteen groundwater monitoring gauges in place are meeting jurisdictional success; six of the eight remaining gauges do not indicate saturation for more than 5% of the growing season. Based on an analysis of local precipitation in 2002, the site's lack of success could be due to below average rainfall amounts in the past year.

Vegetation monitoring yielded an overall average survival rate of 530 trees per acre over four planting zones. This is well above the minimum requirement.

Based on the results of monitoring in 2002, NCDOT recommends continuing hydrologic monitoring for a fifth year. Vegetation monitoring will also continue in 2003.

APPENDIX A

DEPTH TO GROUNDWATER PLOTS

APPENDIX B

SITE PHOTOS



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9

